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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/748,410	12/29/2003	Fay Chong JR.	188164/US	7553

66083 7590 03/04/2008

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EXAMINER	
LE, MIRANDA	

ART UNIT	PAPER NUMBER
2167	

MAIL DATE	DELIVERY MODE
03/04/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

MN

Office Action Summary	Application No.	Applicant(s)	
	10/748,410	CHONG, FAY	
	Examiner	Art Unit	
	MIRANDA LE	2167	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 November 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4-16,18-30 and 32-46* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4-16,18-30 and 32-46* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *12/05/07*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/14/2007 has been entered.

2. This communication is responsive to Amendment, filed 11/14/2007.

Claims 1-2, 4-16, 18-30, 32-46 are pending in this application. Claims 1, 15, 29, 43 are independent claims. In the Amendment, claims 3, 17, 31 have been cancelled, and claims 1, 15, 29, 43 have been amended. This action is made non-Final.

Specification

3. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required:

Claim 15 recites the limitation "a machine-readable storage medium", however, the term "a machine-readable storage medium" is not found in the Specification. There is insufficient antecedent basis for this limitation.

Claim Rejections - 35 USC § 101

4. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter or any new and useful improvement thereof, may obtain a patent therefore, subject to the conditions and requirements of this title.

5. Claims 15-28 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

While amended claim 15 recites "An article of manufacture...a machine-readable storage medium...", the claim still fails to place the invention squarely within one statutory class of invention.

On pages 9-10, paragraph [0042] of the instant specification, applicant has provided evidence that applicant intends the "medium" to include signals. As such, the claim is drawn to a form of energy. Energy is not one of the four categories of invention and therefore this claim(s) is/are not statutory. Energy is not a series of steps or acts and thus is not a process. Energy is not a physical article or object and as such is not a machine or manufacture. Energy is not a combination of substances and therefor not a composition of matter.

A machine-readable medium including carrier waves, or signals, is non-statutory subject matter as set forth in MPEP 2106 (IV)(B)(2)(a). As such, claim 15 is not limited to tangible embodiments, instead being sufficiently broad so as to encompass intangible media such as transmission media; the claims are not limited to statutory subject matter and are therefore non-statutory.

To overcome the issue, it is advised that the specification should be amended to include the term "a machine-readable storage medium"; plus, on page 10, lines 1-2, the

phrase "or other forms of propagated signals (e.g. carrier waves, infrared signals, digital signals, etc. which provide the computer program instructions) should be deleted; and applicant should disvow the terms as well.

Claims 14-28 are dependent upon claim 15, suffer from deficiencies similar to their respective base claim, and therefore are likewise rejected.

6. Claim 29 recites "an apparatus" and invokes 112 6th paragraph by reciting "means for" language. However, each of the means for "receiving...", "executing...", "creating...", "writing...", "creating...", "modifying..." appear to be computer program modules; thus, the claim lacks the necessary physical articles or objects to constitute a machine or a manufacture within the meaning of 35 U.S.C. § 101, instead being software per se.

As such, the claimed apparatus does not define any specific hardware and needs to be amended to include physical computer hardware (e.g. processor, memory) to execute the software components. See MPEP 2106.01.

Claims 30, 32-42 are dependent upon claim 28, respectively, suffer from deficiencies similar to their respective base claims, and therefore are likewise rejected.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 1, 2, 6-8, 11, 12, 15, 16, 20-22, 25, 26, 29, 30, 34-36, 39, 40, 43-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paulson et al. (US Patent No. 6,112,319), in view of Flynn et al. (US Patent No. 6,453,392).

As per claim 1, Paulson teaches a method for preserving data in a data storage system, the method comprising:

receiving a command to preserve data storage system *(i.e. a second write request ("2w") to write the value 2, a second read request ("2f"), col. 4, lines 45-50)*;

executing *(i.e. a first write request ("1w") to write the value 1, a first read ("1r") request, col. 4, lines 45-50)*, for a first data, a fist input/output (I/O) process directed to a first storage volume, wherein the first storage volume is not mirrored and the first I/O process *(i.e. a first write request ("1w") to write the value 1, a first read ("1r") request, col. 4, lines 45-50)* begins at a first time which is prior to receiving the command *(i.e. a second write request ("2w") to write the value 2, a second read request ("2f"), col. 4, lines 45-50)*;

creating a data structure, in response to the command, for at least a second image, the second image storing changes to the first storage volume occurring after receipt of the

command *(i.e. it creates a new data cell, stores the data from the write request in the new cell, and appends the new data cell to the end of the data list for this address cell, col. 7, line 56 to col. 8, line 23)*;

writing a second data *(i.e. When the second write request is received, another data cell would be created that held the value of 2, col. 7, line 56 to col. 8, line 23)* directed to the second image as part of a second I/O process *(i.e. a second write request ("2w") to write the value 2, a second read request ("2f"), col. 4, lines 45-50)* which begins after receipt of the command *(i.e. it creates a new data cell, stores the data from the write request in the new cell, and appends the new data cell to the end of the data list for this address cell, col. 7, line 56 to col. 8, line 23)*; and

modifying the data structure *(i.e. modifies the data structure to reflect the responses, col. 8, lines 55-62)* to indicate that the second data is stored in the second image and storing the second data in the second image *(i.e. If it is for a write request, the routine continues to step 329 where it retrieves the data list for the address cell and removes all of the data cells from the list before the data cell corresponding to the write, col. 8, line 64 to col. 9, line 9)*.

Paulson does not specifically teach:

a second storage volume;

writing a second data directed to the second storage volume as part of a second I/O process which begins after receipt of the command; and

Flynn teaches:

a second storage volume *(i.e. Accordingly, a storage controller is operative to deny a storage device access request from a first virtual machine of a host processor*

responsive to a compare by the storage controller of a first virtual machine ID of the first virtual machine and a second virtual machine ID of a second virtual machine of the host processor. More specifically, the storage controller may be operative to receive a request for accessing a storage device; operative to compare a stored path group ID and a requesting path group ID associated with the request; operative to compare a stored virtual machine ID and a requesting virtual machine ID associated with the request; and operative to grant or deny the request responsive to the compares, col. 10, lines 24-37);

writing a second data directed to the second storage volume as part of a second I/O process which begins after receipt of the command *(i.e. the guest operating system performs device operations (read, write, etc.) on storage device 128, col. 8, lines 24-36).*

It would have been obvious to one of ordinary skill of the art having the teaching of Paulson and Flynn at the time the invention was made to modify the system of Paulson to include the limitations as taught by Flynn. One of ordinary skill in the art would be motivated to make this combination in order to determine the scope of the access request in view of Flynn (Summary), as doing so would give the added benefit of having virtual machines of a single host processor shared the storage device while both preserving data integrity and performing optimally as taught by Flynn (Summary).

As per claim 15, Paulson teaches an article of manufacture comprising:

a machine-readable storage medium having executable code to cause a machine to perform a method for preserving data in a data storage system *(See Fig. 1)*, the method comprising:

receiving a command to preserve data storage system *(i.e. a second write request ("2w") to write the value 2, a second read request ("2f"), col. 4, lines 45-50)*;

executing *(i.e. a first write request ("1w") to write the value 1, a first read ("1r") request, col. 4, lines 45-50)*, for a first data, a fist input/output (I/O) process *(i.e. a first write request ("1w") to write the value 1, a first read ("1r") request, col. 4, lines 45-50)* directed to a first storage volume, wherein the first storage volume is not mirrored and the first I/O process begins at a first time which is prior to receiving the command *(i.e. a second write request ("2w") to write the value 2, a second read request ("2f"), col. 4, lines 45-50)*;

creating a data structure, in response to the command, for at least a second image, the second image storing changes to the first storage volume occurring after receipt of the command *(i.e. it creates a new data cell, stores the data from the write request in the new cell, and appends the new data cell to the end of the data list for this address cell, col. 7, line 56 to col. 8, line 23)*;

writing a second data *(i.e. When the second write request is received, another data cell would be created that held the value of 2, col. 7, line 56 to col. 8, line 23)* directed to the second image as part of a second I/O process *(i.e. a second write request ("2w") to write the value 2, a second read request ("2f"), col. 4, lines 45-50)* which begins after receipt of the command *(i.e. it creates a new data cell, stores the data from the write request in the new cell, and appends the new data cell to the end of the data list for this address cell, col. 7, line 56 to col. 8, line 23)*; and

modifying the data structure *(i.e. modifies the data structure to reflect the responses, col. 8, lines 55-62)* to indicate that the second data is stored in the second

image and storing the second data in the second image *(i.e. If it is for a write request, the routine continues to step 329 where it retrieves the data list for the address cell and removes all of the data cells from the list before the data cell corresponding to the write, col. 8, line 64 to col. 9, line 9).*

Paulson does not specifically teach:

a second storage volume;

writing a second data directed to the second storage volume as part of a second I/O process which begins after receipt of the command; and

Flynn teaches:

a second storage volume *(i.e. Accordingly, a storage controller is operative to deny a storage device access request from a first virtual machine of a host processor responsive to a compare by the storage controller of a first virtual machine ID of the first virtual machine and a second virtual machine ID of a second virtual machine of the host processor. More specifically, the storage controller may be operative to receive a request for accessing a storage device; operative to compare a stored path group ID and a requesting path group ID associated with the request; operative to compare a stored virtual machine ID and a requesting virtual machine ID associated with the request; and operative to grant or deny the request responsive to the compares, col. 10, lines 24-37)*;

writing a second data directed to the second storage volume as part of a second I/O process which begins after receipt of the command *(i.e. the guest operating system performs device operations (read, write, etc.) on storage device 128, col. 8, lines 24-36).*

It would have been obvious to one of ordinary skill of the art having the teaching of Paulson and Flynn at the time the invention was made to modify the system of Paulson

to include the limitations as taught by Flynn. One of ordinary skill in the art would be motivated to make this combination in order to determine the scope of the access request in view of Flynn (Summary), as doing so would give the added benefit of having virtual machines of a single host processor shared the storage device while both preserving data integrity and performing optimally as taught by Flynn (Summary).

As per claim 29, Paulson teaches an apparatus for preserving data in a data storage system, comprising:

means for receiving a command to preserve data storage system *(i.e. a second write request ("2w") to write the value 2, a second read request ("2f"), col. 4, lines 45-50)*;

means for executing *(i.e. a first write request ("1w") to write the value 1, a first read ("1r") request, col. 4, lines 45-50)*, for a first data, a fist input/output (I/O) process directed to a first storage volume, wherein the first storage volume is not mirrored and the first I/O process *(i.e. a first write request ("1w") to write the value 1, a first read ("1r") request, col. 4, lines 45-50)* begins at a first time which is prior to receiving the command *(i.e. a second write request ("2w") to write the value 2, a second read request ("2f"), col. 4, lines 45-50)*;

means for creating a data structure, in response to the command, for at least a second image, the second image storing changes to the first storage volume occurring after receipt of the command *(i.e. it creates a new data cell, stores the data from the write request in the new cell, and appends the new data cell to the end of the data list for this address cell, col. 7, line 56 to col. 8, line 23)*;

means for writing a second data *(i.e. When the second write request is received, another data cell would be created that held the value of 2, col. 7, line 56 to col. 8, line 23)* directed to the second image as part of a second I/O process *(i.e. a second write request ("2w") to write the value 2, a second read request ("2f"), col. 4, lines 45-50)* which begins after receipt of the command *(i.e. it creates a new data cell, stores the data from the write request in the new cell, and appends the new data cell to the end of the data list for this address cell, col. 7, line 56 to col. 8, line 23)*; and

means for modifying the data structure *(i.e. modifies the data structure to reflect the responses, col. 8, lines 55-62)* to indicate that the second data is stored in the second image and storing the second data in the second image *(i.e. If it is for a write request, the routine continues to step 329 where it retrieves the data list for the address cell and removes all of the data cells from the list before the data cell corresponding to the write, col. 8, line 64 to col. 9, line 9)*.

Paulson does not specifically teach:

a second storage volume;

writing a second data directed to the second storage volume as part of a second I/O process which begins after receipt of the command; and

Flynn teaches:

a second storage volume *(i.e. Accordingly, a storage controller is operative to deny a storage device access request from a first virtual machine of a host processor responsive to a compare by the storage controller of a first virtual machine ID of the first virtual machine and a second virtual machine ID of a second virtual machine of the host processor. More specifically, the storage controller may be operative to receive a request*

for accessing a storage device; operative to compare a stored path group ID and a requesting path group ID associated with the request; operative to compare a stored virtual machine ID and a requesting virtual machine ID associated with the request; and operative to grant or deny the request responsive to the compares, col. 10, lines 24-37);

writing a second data directed to the second storage volume as part of a second I/O process which begins after receipt of the command *(i.e. the guest operating system performs device operations (read, write, etc.) on storage device 128, col. 8, lines 24-36).*

It would have been obvious to one of ordinary skill of the art having the teaching of Paulson and Flynn at the time the invention was made to modify the system of Paulson to include the limitations as taught by Flynn. One of ordinary skill in the art would be motivated to make this combination in order to determine the scope of the access request in view of Flynn (Summary), as doing so would give the added benefit of having virtual machines of a single host processor may share the storage device while both preserving data integrity and performing optimally as taught by Flynn (Summary).

As per claim 43, Paulson teaches a data storage system, comprising:

a processing system *(See Fig. 1)*; and

a memory coupled to the processing system, the memory storing instructions, which when executed by the processing system *(See Fig. 1)*, cause the processing system to perform the operations of:

receiving a command to preserve data storage system *(i.e. a second write request ("2w") to write the value 2, a second read request ("2f"), col. 4, lines 45-50)*;

executing *(i.e. a first write request ("1w") to write the value 1, a first read ("1r") request, col. 4, lines 45-50)*, for a first data, a fist input/output (I/O) process *(i.e. a first write request ("1w") to write the value 1, a first read ("1r") request, col. 4, lines 45-50)* directed to a first storage volume, wherein the first storage volume is not mirrored and the first I/O process begins at a first time which is prior to receiving the command *(i.e. a second write request ("2w") to write the value 2, a second read request ("2f"), col. 4, lines 45-50)*;

creating a data structure, in response to the command, for at least a second image, the second image storing changes to the first storage volume occurring after receipt of the command *(i.e. it creates a new data cell, stores the data from the write request in the new cell, and appends the new data cell to the end of the data list for this address cell, col. 7, line 56 to col. 8, line 23)*;

writing a second data *(i.e. When the second write request is received, another data cell would be created that held the value of 2, col. 7, line 56 to col. 8, line 23)* directed to the second image as part of a second I/O process *(i.e. a second write request ("2w") to write the value 2, a second read request ("2f"), col. 4, lines 45-50)* which begins after receipt of the command *(i.e. it creates a new data cell, stores the data from the write request in the new cell, and appends the new data cell to the end of the data list for this address cell, col. 7, line 56 to col. 8, line 23)*; and

modifying the data structure *(i.e. modifies the data structure to reflect the responses, col. 8, lines 55-62)* to indicate that the second data is stored in the second image and storing the second data in the second image *(i.e. If it is for a write request, the routine continues to step 329 where it retrieves the data list for the address cell and*

removes all of the data cells from the list before the data cell corresponding to the write, col. 8, line 64 to col. 9, line 9).

Paulson does not specifically teach:

a second storage volume;

writing a second data directed to the second storage volume as part of a second I/O process which begins after receipt of the command; and

Flynn teaches:

a second storage volume *(i.e. Accordingly, a storage controller is operative to deny a storage device access request from a first virtual machine of a host processor responsive to a compare by the storage controller of a first virtual machine ID of the first virtual machine and a second virtual machine ID of a second virtual machine of the host processor. More specifically, the storage controller may be operative to receive a request for accessing a storage device; operative to compare a stored path group ID and a requesting path group ID associated with the request; operative to compare a stored virtual machine ID and a requesting virtual machine ID associated with the request; and operative to grant or deny the request responsive to the compares, col. 10, lines 24-37)*;

writing a second data directed to the second storage volume as part of a second I/O process which begins after receipt of the command *(i.e. the guest operating system performs device operations (read, write, etc.) on storage device 128, col. 8, lines 24-36).*

It would have been obvious to one of ordinary skill of the art having the teaching of Paulson and Flynn at the time the invention was made to modify the system of Paulson to include the limitations as taught by Flynn. One of ordinary skill in the art would be motivated to make this combination in order to determine the scope of the access request

in view of Flynn (Summary), as doing so would give the added benefit of having virtual machines of a single host processor shared the storage device while both preserving data integrity and performing optimally as taught by Flynn (Summary).

As to claims 2, 16, 30, Flynn teaches the first storage volume is a first virtual logical unit (VLUN) and the second storage volume is a second VLUN *(i.e. a first virtual machine of a host processor responsive to a compare by the storage controller of a first virtual machine ID of the first virtual machine and a second virtual machine ID of a second virtual machine of the host processor, col. 10, lines 24-37).*

As to claims 6, 20, 34, Paulson teaches receiving a third data being written to a data block of the second storage volume *(i.e. a third write request ("3w") to write the value 3, col. 4, lines 45-50)*;

updating the data structure to indicate the data block is stored on the second storage image *(i.e. modifies the data structure to reflect the responses, col. 8, lines 55-62)*; and

writing the third data to the data block on the second image *(i.e. FIG. 4E corresponds to the receipt of write request W3, indicating a request to write value W3 to memory address ADR1. FIG. 4E includes address cell 410 and data cells 420 and 430, col. 11, lines 5-28).*

As to claims 7, 21, 35, Paulson teaches updating comprises: determining whether the data block is stored on the first storage image *(i.e. FIG. 2 is a flow diagram for an*

implementation of the Request Tracker routine 205. The Request Tracker routine monitors read and write requests, and maintains a request data structure which contains the possible data which could be returned by the satisfaction of an accurate read request ... For each read request, the routine verifies that the read address is accurate, and if so it updates the corresponding address cell and its data list to reflect a pending read request. For each write request, the routine creates a new address cell if one does not yet exist for the address, and stores the data to be written in either a new or existing data cell for the address, col. 6, line 62 to col. 7, 18); and

updating the data structure to indicate the data block is stored on the second storage image, if the data block is stored on the first image *(i.e. FIG. 2 is a flow diagram for an implementation of the Request Tracker routine 205. The Request Tracker routine monitors read and write requests, and maintains a request data structure which contains the possible data which could be returned by the satisfaction of an accurate read request ... For each read request, the routine verifies that the read address is accurate, and if so it updates the corresponding address cell and its data list to reflect a pending read request. For each write request, the routine creates a new address cell if one does not yet exist for the address, and stores the data to be written in either a new or existing data cell for the address, col. 6, line 62 to col. 7, 18).*

As to claims 8, 22, 36, Paulson teaches examining a lookup table to determine whether there is an entry associated with the data block, the lookup table being associated with the second storage image *(i.e. FIG. 2 is a flow diagram for an implementation of the Request Tracker routine 205. The Request Tracker routine monitors read and write*

requests, and maintains a request data structure which contains the possible data which could be returned by the satisfaction of an accurate read request ... For each read request, the routine verifies that the read address is accurate, and if so it updates the corresponding address cell and its data list to reflect a pending read request. For each write request, the routine creates a new address cell if one does not yet exist for the address, and stores the data to be written in either a new or existing data cell for the address, col. 6, line 62 to col. 7, 18); and

creating the entry associated with the data block if the entry does not exist *(i.e. FIG. 2 is a flow diagram for an implementation of the Request Tracker routine 205. The Request Tracker routine monitors read and write requests, and maintains a request data structure which contains the possible data which could be returned by the satisfaction of an accurate read request ... For each read request, the routine verifies that the read address is accurate, and if so it updates the corresponding address cell and its data list to reflect a pending read request. For each write request, the routine creates a new address cell if one does not yet exist for the address, and stores the data to be written in either a new or existing data cell for the address, col. 6, line 62 to col. 7, 18).*

As to claims 11, 25, 39, Paulson teaches receiving a request to read from a data block on the second storage volume *(i.e. FIG. 2 is a flow diagram for an implementation of the Request Tracker routine 205. The Request Tracker routine monitors read and write requests, and maintains a request data structure which contains the possible data which could be returned by the satisfaction of an accurate read request ... For each read request, the routine verifies that the read address is accurate, and if so it updates the*

corresponding address cell and its data list to reflect a pending read request. For each write request, the routine creates a new address cell if one does not yet exist for the address, and stores the data to be written in either a new or existing data cell for the address, col. 6, line 62 to col. 7, 18);

determining whether the data block is stored in the first image or the second image, based the data structure associated with the second storage image *(i.e. FIG. 2 is a flow diagram for an implementation of the Request Tracker routine 205. The Request Tracker routine monitors read and write requests, and maintains a request data structure which contains the possible data which could be returned by the satisfaction of an accurate read request ... For each read request, the routine verifies that the read address is accurate, and if so it updates the corresponding address cell and its data list to reflect a pending read request. For each write request, the routine creates a new address cell if one does not yet exist for the address, and stores the data to be written in either a new or existing data cell for the address, col. 6, line 62 to col. 7, 18)*;

reading the data block from the first image if the data block is stored in the first image *(i.e. FIG. 2 is a flow diagram for an implementation of the Request Tracker routine 205. The Request Tracker routine monitors read and write requests, and maintains a request data structure which contains the possible data which could be returned by the satisfaction of an accurate read request ... For each read request, the routine verifies that the read address is accurate, and if so it updates the corresponding address cell and its data list to reflect a pending read request. For each write request, the routine creates a new address cell if one does not yet exist for the address, and stores the*

data to be written in either a new or existing data cell for the address, col. 6, line 62 to col. 7, 18); and

reading the data block from the second image if the data block is stored in the second image *(i.e. FIG. 2 is a flow diagram for an implementation of the Request Tracker routine 205. The Request Tracker routine monitors read and write requests, and maintains a request data structure which contains the possible data which could be returned by the satisfaction of an accurate read request ... For each read request, the routine verifies that the read address is accurate, and if so it updates the corresponding address cell and its data list to reflect a pending read request. For each write request, the routine creates a new address cell if one does not yet exist for the address, and stores the data to be written in either a new or existing data cell for the address, col. 6, line 62 to col. 7, 18).*

As to claims 12, 26, 40, Paulson teaches examining a lookup table to determine whether there is an entry associated with the data block, the lookup table being associated with the second storage image *(i.e. FIG. 2 is a flow diagram for an implementation of the Request Tracker routine 205. The Request Tracker routine monitors read and write requests, and maintains a request data structure which contains the possible data which could be returned by the satisfaction of an accurate read request ... For each read request, the routine verifies that the read address is accurate, and if so it updates the corresponding address cell and its data list to reflect a pending read request. For each write request, the routine creates a new address cell if one does not yet exist for the*

address, and stores the data to be written in either a new or existing data cell for the address, col. 6, line 62 to col. 7, 18).

As to claims 44, 45, 46, Flynn teaches the second I/O process is capable of accessing the same data, via the second storage volume, as the first I/O process *(i.e. a first virtual machine of a host processor responsive to a compare by the storage controller of a first virtual machine ID of the first virtual machine and a second virtual machine ID of a second virtual machine of the host processor, col. 10, lines 24-37).*

9. Claims 4, 5, 9, 10, 13, 14, 18, 19, 23, 24, 27, 28, 32, 33, 37, 38, 41, 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paulson et al. (US Patent No. 6,112,319), in view of Flynn et al. (US Patent No. 6,453,392), and further in view of Kakivaya et al. (US Patent No. 6,546,443).

As to claims 4, 18, 32, Paulson and Flynn do not explicitly teach acquiring a lock from a lock mechanism before modifying the data structure to indicate that the second data is stored in the second image; and releasing the lock after storing the second data in the first image.

Kakivaya teaches:

acquiring a lock from a lock mechanism before modifying the data structure to indicate that the second data is stored in the second image *(i.e. a method and system for providing reader/writer synchronization services using interlocked operations, col. 3, lines 10-16)*; and

releasing the lock after storing the second data in the first image *(i.e. ReleaseWriterLock( ), col. 9, lines 41-52).*

It would have been obvious to one of ordinary skill of the art having the teaching of Paulson, Flynn, Kakivaya at the time the invention was made to modify the system of Paulson, Flynn to include the limitations as taught by Kakivaya. One of ordinary skill in the art would be motivated to make this combination in order to provide reader/writer synchronization services using interlocked operations in view of Kakivaya (col. 3, lines 10-16), as doing so would give the added benefit of obtaining a mechanism for avoiding the deadlock problem as taught by Kakivaya (col. 3, lines 6-9).

As to claims 5, 19, 33, Kakivaya teaches the lock mechanism is maintained independent to the first and the second storage images *(i.e. a method and system for providing reader/writer synchronization services using interlocked operations, col. 3, lines 10-16).*

As to claims 9, 23, 37, Paulson and Flynn do not explicitly teach acquiring a lock from a lock mechanism before the updating; and releasing the lock after the writing.

Kakivaya teaches:

acquiring a lock from a lock mechanism before the updating *(i.e. a method and system for providing reader/writer synchronization services using interlocked operations, col. 3, lines 10-16)*; and

releasing the lock after the writing *(i.e. ReleaseWriterLock( ), col. 9, lines 41-52).*

It would have been obvious to one of ordinary skill of the art having the teaching of Paulson, Flynn, Kakivaya at the time the invention was made to modify the system of Paulson, Flynn to include the limitations as taught by Kakivaya. One of ordinary skill in the art would be motivated to make this combination in order to provide reader/writer synchronization services using interlocked operations in view of Kakivaya (col. 3, lines 10-16), as doing so would give the added benefit of obtaining a mechanism for avoiding the deadlock problem as taught by Kakivaya (col. 3, lines 6-9).

As to claims 10, 24, 38, Kakivaya teaches the lock mechanism is maintained independent to the first and the second storage images *(i.e. a method and system for providing reader/writer synchronization services using interlocked operations, col. 3, lines 10-16).*

As to claims 13, 27, 41, Paulson and Flynn do not specifically teach acquiring a lock from a lock mechanism before the determining; and releasing the lock after the reading.

Kakivaya teaches:

acquiring a lock from a lock mechanism before the determining *(i.e. a method and system for providing reader/writer synchronization services using interlocked operations, col. 3, lines 10-16)*; and

releasing the lock after the reading *(i.e. ReleaseWriterLock( ), col. 9, lines 41-52).*

It would have been obvious to one of ordinary skill of the art having the teaching of Paulson, Flynn, Kakivaya at the time the invention was made to modify the system of

Paulson, Flynn to include the limitations as taught by Kakivaya. One of ordinary skill in the art would be motivated to make this combination in order to provide reader/writer synchronization services using interlocked operations in view of Kakivaya (col. 3, lines 10-16), as doing so would give the added benefit of obtaining a mechanism for avoiding the deadlock problem as taught by Kakivaya (col. 3, lines 6-9).

As to claims 14, 28, 42, Kakivaya teaches the lock mechanism is maintained independent to the first and the second storage images *(i.e. a method and system for providing reader/writer synchronization services using interlocked operations, col. 3, lines 10-16).*

Response to Arguments

10. Applicants have amended the independent claims 1, 15, 29, 43 to recite "executing,

for a first data, a first input/output (I/0) process directed to a first storage volume, wherein the first storage volume is not mirrored ..." and "creating a data structure, in response to the command, for at least a second image which corresponds to a second storage volume, the second storage volume storing changes to the first storage volume occurring after receipt of the command" to overcome the Innan reference. Applicant's arguments have been considered; however, upon further consideration, a new ground(s) of rejection is made in view of newly found prior arts.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Miranda Le whose telephone number is (571) 272-4112. The examiner can normally be reached on Monday through Friday from 8:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R. Cottingham, can be reached on (571) 272-7079. The fax number to this Art Unit is (571)-273-8300.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (571) 272-2100.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Miranda Le
February 26, 2008